

REMARKS

The Office Action dated October 19, 2006 has been received and carefully noted. The above amendments to the claims, and the following remarks, are submitted as a full and complete response thereto.

Claims 1-4 are currently pending in the application. Claim 3 has been amended to more particularly point out and distinctly claim the subject matter of the invention. No new matter has been added. Therefore, claims 1-4 are currently pending in the application and are respectfully submitted for consideration.

The Office Action objected to claim 3 under 37 CFR §1.75(c) as being of improper dependent form for failing to further limit the subject matter of a previous claim. Specifically, the Examiner contends that claim 1 recites that the air flow rate sensor is "provided in at least a portion of the plurality of branch pipes." Claim 3 then recites that the air flow rate sensor is provided in the collecting pipe. Applicants respectfully submit that this objection is rendered moot for the following reasons.

Claim 3 has been amended to recite that "an air flow rate sensor is provided in the collecting pipe." Therefore, the present invention provides an air flow rate sensor in the branch pipes, as recited in claim 1, and another air flow rate sensor in the collecting pipe, as recited in claim 3. As such, Applicants respectfully submit that the objection to claim 3 is rendered moot.

The Office Action rejected claims 1 and 2 under 35 U.S.C. §102(b) as being anticipated by JP 9-4487 (hereinafter JP '487). The rejection is respectfully traversed for the following reasons.

Claim 1, upon which claims 2 and 3 are dependent, recites an air intake apparatus for an internal combustion engine. The air intake apparatus comprising an air intake manifold that has a plurality of branch pipes that are connected to an internal combustion engine and has a collecting pipe to which a throttle body is connected, in which an air intake quantity that is taken into the internal combustion engine is adjusted using a throttle valve of the throttle body, and in which a fuel injection quantity is adjusted in accordance with the air intake quantity. An air flow rate sensor that detects a quantity of air that is taken into the internal combustion engine is provided in at least a portion of the plurality of branch pipes.

As will be discussed below, the cited prior art fails to disclose or suggest all of the elements of the claims, and therefore fails to provide the features discussed above.

JP '487 discloses an air flow rate measuring device for an internal combustion engine. A module housing 1 for holding a circuit module is utilized so as to integrally form an auxiliary air passage 3. The circuit module 5 and the auxiliary air passage 3 are arranged flush with each other so that the module housing 1 is in flat form. The module housing 1 is inserted into an air intake passage 11.

Applicants respectfully submit that JP '487 fails to disclose or suggest all of the elements of the claimed invention. For example, JP '487 does not disclose or suggest that "an air flow rate sensor that detects a quantity of air that is taken into the internal combustion engine is provided in at least a portion of the plurality of branch pipes," as recited in claim 1.

According to an embodiment of the present invention, an air flow meter 28 is provided on each branch pipe 7 of the air intake manifold 6. Accordingly, the air flow meters 28 are each located at a downstream position of the air flow of the air intake manifold 6 and immediately in front of the air intake port 5 of each cylinder (Specification, page 9, lines 13-16). As a result of this configuration of the air intake apparatus, in air flow rate sensor equipped cylinders that are provided with an air flow rate sensor on a branch pipe, it is possible to directly measure only the quantity of air that is taken into the internal combustion engine and to exclude the air that fills the interior of the air intake manifold (Specification, page 4, lines 18-22). JP '487 fails to disclose or suggest such a configuration for an air intake apparatus and, therefore, does not disclose or suggest that "an air flow rate sensor that detects a quantity of air that is taken into the internal combustion engine is provided in at least a portion of the plurality of branch pipes," as recited in claim 1.

Claim 2 is dependent upon claim 1. Therefore, claim 2 should be allowed for at least its dependence upon claim 1, and for the specific limitations recited therein.

Claim 3 was rejected under 35 U.S.C. §103(a) as being unpatentable over JP '487 in view of Kanke (U.S. Patent Pub. No. 2003/0070494). The Office Action took the position that JP '487 discloses all of the elements of claim 3, with the exception of an air flow rate sensor being provided in the collecting pipe. The Office Action then cites Kanke as allegedly curing this deficiency in JP '487. The rejection is respectfully traversed for the following reasons.

JP '487 is discussed above. Kanke discloses an air flow meter which decreases the error due to back flow. A throttle valve 17 which opens and shuts the air intake passage is installed in the air intake passage of the internal combustion engine. The first sensor part 161 is installed in the air intake passage in the upstream of throttle valve 17. Further, the second sensor part 141 is installed in the air intake passage in the downstream of throttle valve 17. Pulsation compensating means 671 corrects the pulsation of the air flow rate signal detected by the first sensor part by using the output signals of the first and the second sensor parts 161, 141 based on each cylinder of the internal combustion engine.

Applicants respectfully submit that the combination of JP '487 and Kanke fails to disclose or suggest all of the elements of claim 3. For instance, the combination of JP '487 and Kanke does not disclose or suggest that an air flow rate sensor is provided in the collecting pipe, as recited in claim 3. As mentioned above, the Office Action took the position that Kanke discloses this element of the claim. However, Applicants respectfully disagree.

According to an example of the air intake apparatus of the present invention, one of the air flow rate sensors may be provided in the collecting pipe. According to this configuration of the air intake apparatus, in air flow rate sensor equipped cylinders that are provided with an air flow rate sensor on a branch pipe, it is possible to directly measure only the quantity of air that is taken into the internal combustion engine and to exclude the air that fills the interior of the air intake manifold. Moreover, in cylinders other than the air flow rate sensor equipped cylinders, it is possible to more accurately measure the air intake quantity by performing processing such as subtracting the air intake quantity in the air flow rate sensor equipped cylinders from the total air intake quantity measured by the air flow rate sensor provided in the collecting pipe, and by also using a rotation angle sensor that detects rotation angles in the crankshaft or camshaft (Specification, page 4, lines 15-25).

Kanke, on the other hand, merely discloses that the amount of intake air used for the calculation of fuel injection amount is measured by sensor part 161,141 of the air flow meter in throttle-integrated air flow meter 20. Sensor part 161 is arranged on the upstream side of throttle valve 17, and sensor part 141 is arranged on the downstream side of throttle valve 17 (Kanke, paragraph 0065). Kanke fails to disclose or suggest that the sensors 161, 141 are provided in the collecting pipe. JP '487, as acknowledged in the Office Action, also fails to disclose or suggest this element of the claims. Thus, the combination of JP '487 and Kanke does not disclose or suggest that an air flow rate sensor is provided in the collecting pipe, as recited in claim 3.

Additionally, claim 3 should be allowed for at least its dependence upon claim 1, and for the specific limitations recited therein. Therefore, for at least the reasons discussed above, Applicants respectfully request that the rejection of claim 3 be withdrawn.

Claim 4 was rejected under 35 U.S.C. §103(a) as being unpatentable over Topfer (U.S. Patent No. 5,623,900) in view of Kanke. The rejection is respectfully traversed for the following reasons.

Claim 4 recites an air intake apparatus for an internal combustion engine. The air intake apparatus includes an air intake manifold that has a plurality of branch pipes that are connected to an internal combustion engine and has a collecting pipe to which a throttle body is connected, in which an air intake quantity that is taken into the internal combustion engine is adjusted using a throttle valve of the throttle body, and in which a fuel injection quantity is adjusted in accordance with the air intake quantity. An extended portion that extends towards the branch pipe side is provided on an end portion on the branch pipe side of the collecting pipe, and an air flow rate sensor that detects a quantity of air that is taken into the internal combustion engine is provided on this extended portion.

As will be discussed below, the cited prior art fails to disclose or suggest all of the elements of the claim 4, and therefore fails to provide the features discussed above.

Kanke is discussed above. Topfer discloses an internal combustion engine having an intake system including a chamber with an intake connection and individual suction pipes which lead into the individual cylinders. The interior of the chamber is connected to a pollutant reducing system that includes systems, such as a housing venting system, an auxiliary air feeding system, a fuel vapor catch system, and an exhaust gas return system. An intake pipe, which projects into the chamber of the intake system, is fastened to the intake connection. The intake pipe has a mouth opening approximately in a plane between two central individual suction pipes and a pipe connection leads into the interior of the chamber which connects the systems of the pollutant reducing system.

Applicants respectfully submit that the cited prior art fails to disclose or suggest all of the elements of claim 4. For example, the combination of Topfer and Kanke does not disclose or suggest that “an extended portion that extends towards the branch pipe side is provided on an end portion on the branch pipe side of the collecting pipe, and an air flow rate sensor that detects a quantity of air that is taken into the internal combustion engine is provided on this extended portion,” as recited in claim 4.

According to an example of the air intake apparatus of the present invention, an extended portion 8' that extends towards the branch pipes 7 is provided at an end portion on the downstream side of the collecting pipe 8 of the air intake manifold 6, namely, at an end portion on the branch pipe 7 side. An air flow meter 28 is provided on this extended portion 8'. As a result, the air flow meter 28 can be placed in close proximity to the respective branch pipes 7. When the internal combustion engine is operating, and a

throttle valve is initially opened, because an air flow rate sensor is placed in close proximity to each branch pipe, the sensitivity of the detection of the air flow into the internal combustion engine is increased. Accordingly, the air intake rise point and the air intake fall point of each cylinder can be ascertained. In addition, it becomes possible to perform control such that fuel is injected at an accurate timing into each cylinder based on the air intake rise point detected by an air flow rate sensor. Moreover, by establishing settings such that an air intake fall point detected by an air flow rate sensor can be regarded as indicating that the intake of air into the internal combustion engine has ended, it becomes possible to measure the air intake quantity from the point in time when the air intake commences to a point immediately prior to the ending of the air intake (Specification, page 15, lines 1-19 and Fig. 5).

The combination of Topfer and Kanke, on the other hand, does not disclose or suggest this configuration of the air intake apparatus. As discussed above, Kanke merely discloses that sensor part 161,141 for measuring the amount of intake air used for the calculation of fuel injection amount is provided in the throttle-integrated air flow meter 20. While Topfer merely discloses an intake pipe 7 projects into the chamber 1 of the intake system and is connected to air supply system. Topfer does not disclose that “an extended portion that extends towards the branch pipe side is provided on an end portion on the branch pipe side of the collecting pipe,” as recited in claim 4. Furthermore, even when Topfer and Kanke are combined, they do not appear to disclose or suggest that “an

air flow rate sensor that detects a quantity of air that is taken into the internal combustion engine is provided on this extended portion,” as recited in claim 4.

Additionally, Topfer discloses that the air guiding pipe of Topfer is for reducing airborne noise. However, the extended portion of the present invention is for locating the air flow rate sensor close to the branch pipe. Consequently, the purpose of the extended portion of the present invention differs from that of the air guiding pipe of Topfer. As a result, there is no logical necessity that the air flow rate sensor of the present invention be provided on the air guiding pipe of Topfer. Therefore, Applicants respectfully submit that it would not be obvious to a person having ordinary skill in the art to modify Topfer or Kanke to yield the claimed invention.

Therefore, for at least the reasons discussed above, Applicants respectfully assert that the combination of Topfer and Kanke does not disclose or suggest all of the elements of claim 4. Accordingly, Applicants request that the rejection of claim 4 be withdrawn.

Applicants respectfully submit that the cited prior art fails to disclose or suggest all of the elements of the claimed invention. These distinctions are more than sufficient to render the claimed invention unanticipated and unobvious. It is therefore respectfully requested that all of claims 1-4 be allowed, and this application passed to issue.

If for any reason the Examiner determines that the application is not now in condition for allowance, it is respectfully requested that the Examiner contact, by telephone, the applicant's undersigned attorney at the indicated telephone number to arrange for an interview to expedite the disposition of this application.

In the event this paper is not being timely filed, the applicant respectfully petitions for an appropriate extension of time. Any fees for such an extension together with any additional fees may be charged to Counsel's Deposit Account 50-2222.

Respectfully submitted,



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